CLAIMS

WE CLAIM:

1.   A method of improving an efficiency of transmitting a continuous media program on-demand to multiple consumers, wherein the media program is transmitted, from at least one regional storage location serving a corresponding plurality of consumers and a remote storage location in communication with the at least one regional storage
5   location, in response to a plurality of consumer requests, the method comprising:

(a) splitting the program into a prefix and a suffix as a function of at least 1) costs associated with storing the prefix at the at least one regional storage location and 2) costs of transmitting the suffix from the remote storage location;

(b) storing the prefix in the at least one regional storage location;

10   (c) storing the suffix in the remote storage location;

(d) transmitting the prefix to the plurality of consumers from the corresponding at least one regional storage location; and

(e) transmitting the suffix to the plurality of consumers from the remote storage location.

2.   The method as recited in claim 1, further comprising transmitting the prefix and suffix continuously.

3.   The method as recited in claim 2, wherein the prefix comprises a leading group of segments, and wherein the suffix comprises a trailing group of segments.

4.   The method as recited in claim 3, wherein the prefix and suffix are chosen so as to reduce the combined storage and bandwidth costs associated with transmitting an entire given media program to the plurality of clients.

5.   The method as recited in claim 4, wherein the prefix and suffix are chosen so as to average down the combined storage and bandwidth costs associated with transmitting a plurality of media programs to the plurality of clients.

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6. The method of claim 1, wherein the continuous media program is transmitted in accordance with a skyscrapering technique.

7. The method as recited in claim 1, wherein the prefix and suffix comprise a plurality of sequential segments of data.

8. The method as recited in claim 7, wherein the segments of the prefix are smaller than the segments of the suffix.

9. The method as recited in claim 1, wherein the media program may be transmitted via at least one of phone lines, cable systems, broadcast radio, and satellite links.

10. The method as recited in claim 1, wherein the prefix and suffix are further split as a function of costs associated with transmitting the prefix.

11. The method as recited in claim 1, wherein the prefix and suffix are further split as a function of costs associated with storing the sufix.

12. A method of reducing operation costs of an on-demand media file delivery system, wherein the media file is transmitted, from at least one of a plurality of regional servers and a remote server located remotely from the plurality of regional servers, in response to a plurality of client requests, the method comprising:

5   (a) splitting the media file into a prefix and a suffix;

(b) storing the prefix at the at least one regional server;

(c) storing the suffix at the remote storage location;

(d) transmitting the prefix to the plurality of clients from the at least one regional server; and

10   (e) transmitting the suffix to the plurality of clients from the remote server,

wherein the prefix and suffix are determined so as to reduce costs associated with transmitting the media file to the plurality of clients.

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13.   The method as recited in claim 12, wherein the prefix and suffix are further determined so as to reduce the storage costs of the prefix, and to reduce the transmission costs of the suffix.

14.   A method of improving an efficiency of transmitting a plurality of continuous media program on-demand to multiple consumers, wherein the media programs are transmitted, from at least one regional server serving a corresponding plurality of consumers and a remote server in communication with the at least one regional server, in response to a plurality of consumer requests, the method comprising:

      (a) splitting the programs into prefixes and a suffixes as a function of at least 1) costs associated with storing the prefixes at the at least one regional storage location and 2) costs of transmitting the suffix from the remote storage location;

      (b) storing some of the prefixes in the at least one regional server;

      (c) storing some of the suffixes in the remote server;

      (d) transmitting the prefix of a requested media program to a plurality of requesting consumers from the corresponding at least one regional server; and

      (e) transmitting the suffix of the requested media program to the plurality of requesting consumers from the remote server.

15.   The method as recited in claim 14, wherein the prefix of the requested media program is empty, and the suffix comprises the entire media program.

16.   The method as recited in claim 14, wherein the suffix of the requested media program is empty, and the prefix comprises the entire media program.

17.   The method as recited in claim 14, wherein the prefixes and suffixes are determined for the plurality of media programs based at least in part on popularity levels of the media programs.

18.   The method as recited in claim 14, wherein the prefixes and suffixes may be chosen according to the optimization model:

$$\min_{\theta} \quad C_{remote}(\theta) + P\beta C_{regional}(\theta)$$

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, wherein:

C_{remote} is a number of channels for remote server multicasts;

5    $C_{regional}$ is a number of channels for regional server multicasts;

P is a number of regional servers;

β is a cost of a regional server channel, relative to that of a remote server channel, and

θ represents whether one of all and a portion of an object are stored at least at one of the regional and remote servers.

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19.   The method as recited in claim 14, wherein the model is subject to the conditions of:

$C_{regional}(\theta) \leq N_{channels}$;

$D_{regional}(\theta) \leq N_{segments}$;

5    $\theta_i^R, + \theta_i^P +, \theta_i^r = 1, i = 1,2,..., n;$ and

$\theta_i^R, \theta_i^P, \theta_i^r \in \{0,1\}, i = 1,2,...,n,$

wherein:

i is the media program;

θ_i^R has a value of 1 if the media program is stored only at the remote server, and

10   has a value of 0 if the media program is not stored at the remote server;

θ_i^P has a value of 1 if the prefix is stored at the regional server, and has a value of 0 if the prefix is not stored at the regional server;

θ_i^r has a value of 1 if the entire media file is stored regionally, and has a value of 0 if the entire media file is not stored regionally;

15    $N_{channels}$ is a maximum number of channels at each regional storage location; and

$N_{segments}$ is a storage capacity at each regional server.